

AMENDMENTS TO THE CLAIMS:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Claims 1-31. (Cancelled)

Claim 32 (New) A method for producing a filter element that includes the following successive steps:

- 1) application of a membrane layer to a carrier substrate,
- 2) etching a membrane chamber on the side of the carrier substrate opposite to the membrane layer, so that a residual layer of the carrier substrate still remains,
- 3) generation of pores in the membrane layer by means of a lithographic and etching process in order to create a perforated membrane,

4) removal of the residual layer of the membrane chamber by etching in order to expose the membrane layer of the membrane chamber, and

5) subjecting the membrane to an additional treatment in order to increase its mechanical strength, which additional treatment consists of one or more the following:

5.1) formation of crystal nuclei in the membrane layer in step 1,

5.2) heating temperature treatment of a structure of carrier layer and membrane layer in order to increase the crystalline fraction in the membrane layer in step 1 and/or after step 4,

5.3) isostatic hot pressing of the structure of carrier layer and membrane layer to increase the crystalline fraction in the membrane layer prior to step 3 or after step 4, and

5.4) generation of an internal prestress in the membrane layer in step 1 or after step 4.

Claim 33. (New) A method as in Claim 1, wherein the treated membrane layer has a crystalline fraction of at least 25%.

Claim 34. (New) A method as in Claim 1, wherein the membrane layer is applied to the carrier substrate by means of a chemical vapor deposition process (CVD process).

Claim 35. (New) A method as in Claim 1, wherein the membrane layer is applied to the carrier substrate by means of a physical vapor deposition process (PVD process).

Claim 36. (New) A method as in Caim 1, wherein the membrane layer consists of a ceramic material.

Claim 37. (New) A method as in Claim 5, wherein the membrane layer consists of a non-oxide ceramic.

Claim 38. (New) A method as in Claim 6, wherein the membrane layer consists of a nitride non-oxide ceramic.

Claim 39. (New) A method as in Claim 7, wherein the membrane layer consists of Si_3N_4 .

Claim 40. (New) A method as in Claim 6, wherein the membrane layer consists of a carbide non-oxide ceramic.

Claim 41. (New) A method as in Claim 9, wherein the membrane layer consists of SiC.

Claim 42. (New) A method as in Claim 1, wherein the heating temperature treatment is performed and is performed by holding

the membrane layer in a temperature range of about 200°C to 2000°C at a process pressure of about 5 Pa - 100 Pa.

Claim 43. (New) A method as in Claim 1, wherein the heating temperature treatment step is performed and is performed and is a sintering at temperatures over about 900°C.

Claim 44. (New) A method as in Claim 1, wherein the temperature treatment is performed and is carried out by means of electromagnetic radiation in the radiowave or microwave range.

Claim 45. (New) A method as in Claim 13, wherein the microwave radiation lies in the frequency range above 25 GHz, preferably in a frequency range at which the material of the membrane layer has a peak in its absorption curve.

Claim 46. (New) A method as in Claim 1, wherein the isostatic hot pressing is performed and is carried out at temperatures above about 750°C and pressures above about 100 bar.

Claim 47. (New) A method as in Claim 1, wherein the isostatic hot pressing step performed and is carried out prior to step 3.

Claim 48. (New) A method as in Claim 1, wherein the membrane layer is protected against etching agents after step 3.

Claim 49. (New) A method as in Claim 17, wherein the membrane is protected by a solid masking.

Claim 50. (New) A method as in Claim 17, wherein the membrane layer is protected by a coating material that is again removed after step 4.

Claim 51. (New) A filter element with a membrane layer and a carrier layer, wherein the membrane layer has a plurality of perforations, wherein in the carrier layer a membrane chamber is exposed, the membrane layer spans over the membrane chamber, and the membrane layer has a compacted and/or at least partially crystalline structure with strength that has been increased over that of the starting material.

Claim 52. (New) A filter element as in Claim 20, wherein the increased strength of the membrane layer is produced through an internal mechanical prestress.

Claim 53. (New) A filter element as in Claim 20, wherein the membrane layer has microcrystalline and/or nanocrystalline structures and/or has been compacted.

Claim 54. (New) A filter element as in Claim 20, wherein the carrier substrate has a plurality of membrane chambers, each of which is spanned over by one and the same membrane layer.

Claim 55. (New) A filter element as in Claim 20, wherein the membrane chamber is rectangular in plan view.

Claim 56. (New) A filter element as in Claim 24, wherein the membrane chamber in plan view has the shape of a slot, whose length is at least twice its width.

Claim 57. (New) A filter element as in Claim 20, wherein two oppositely lying sides of the membrane chamber run at an angle of less than 90° to the plane of the membrane.

Claim 58. (New) A filter element as in Claim 20, wherein the pore ratio of the thickness D of the membrane and pore diameter P have the following relationship: $0.01 < D/P < 100$, where the following applies for the thickness D of the membrane: $0.01 \mu\text{m} < D < 100 \mu\text{m}$.

Claim 59. (New) A filter element as in Claim 20, wherein the pores are essentially circular in shape and have a diameter in the range between $0.01 \mu\text{m}$ and $100 \mu\text{m}$.

Claim 60. (New) A filter element as in Claim 20, wherein the membrane layer, on a side turned toward the membrane chamber, lies on at least one intermediate support, the thickness of which is less than the thickness of the carrier substrate.

Claim 61. (New) A filter element as in Claim 20, wherein the membrane chamber essentially extends over the entire area of the filter element.

Claim 62. (New) A filter element as in Claim 20, wherein the carrier substrate is made from a material selected from the group consisting of Si, SiC, titanium oxides and other titanium compounds, magnesium oxide, zirconium oxide, nickel, chromium, Ni-chromium compounds, Al_2O_3 , yttrium compounds, and that the membrane layer consists of Si_3N_4 , SiC, a combination of the two substances or another silicon ceramic.